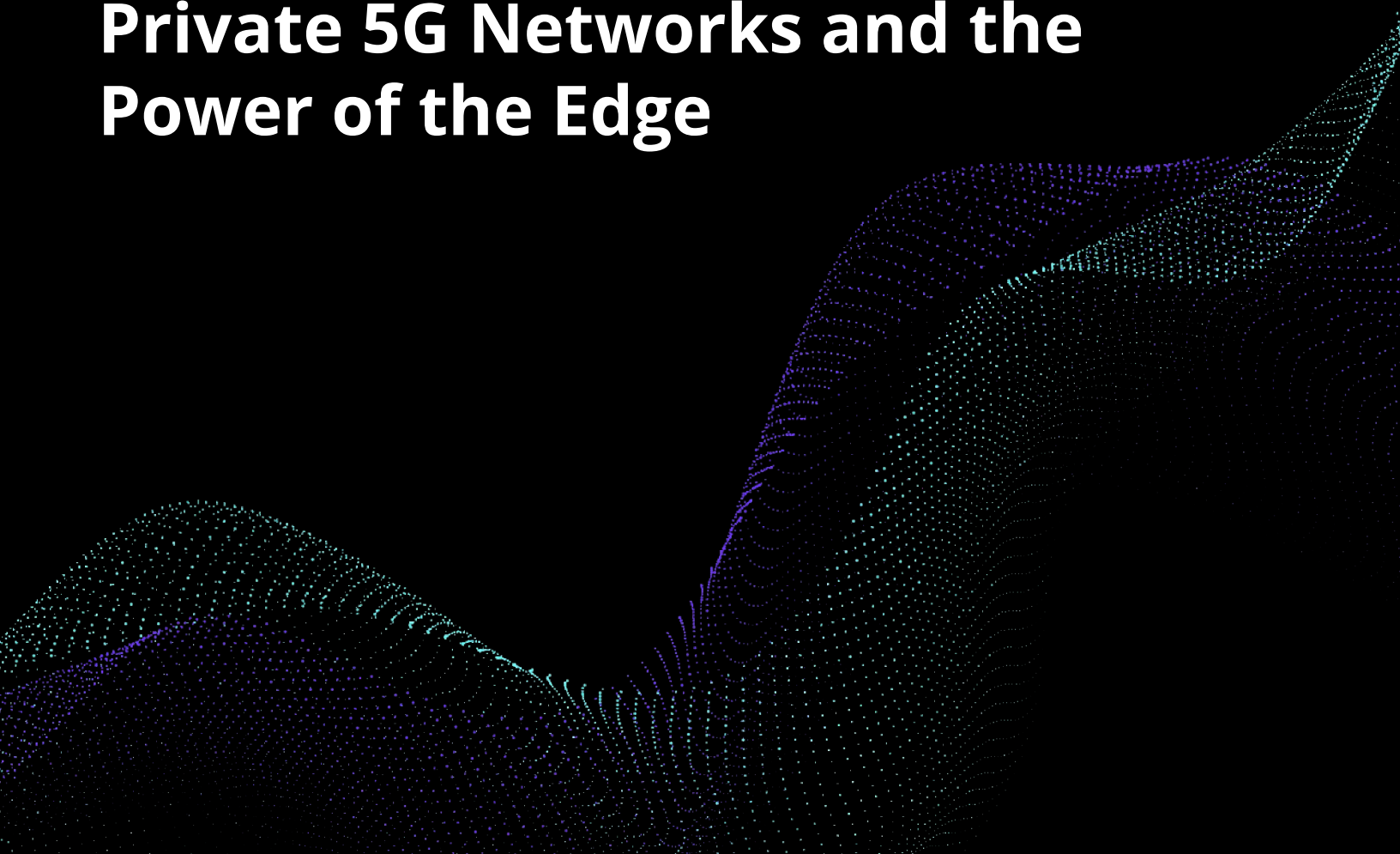
ALEF

The Art of the Possibility:

Private 5G Networks and the Power of the Edge



Peter Levine gave a seminal presentation titled “The End of Cloud Computing" in December of 2016. He foretold the rise of “edge computing” as IoT devices and machine learning applications would start to produce more data and require more compute power. A brilliant piece of insight from his presentation was the recognition that the decentralization of computing is a recurring theme as computers become more powerful. We have been here before with both personal computers and mobile computing.

But what does compute power and decentralization have to do with you or your business? At Alef, we believe that the way you interact with the internet is changing. And the internet is changing in the following ways:

- There is a decentralization that is taking place within the inherent architecture of the internet. We are going from hundreds of mobile networks to potentially millions of private networks, which can all be connected to each other. Storage and compute is also being moved closer to the user / application with efforts being made in the micro and metro edge data center worlds.

- Data is being produced at an ever-increasing rate thanks to advances in connectivity, software, and hardware. This data is being produced at a rate that is quickly overwhelming transport capabilities and at the same time producing more noise than signal. Running machine learning at the edge is enabling businesses to find the signal within the noise much more quickly.

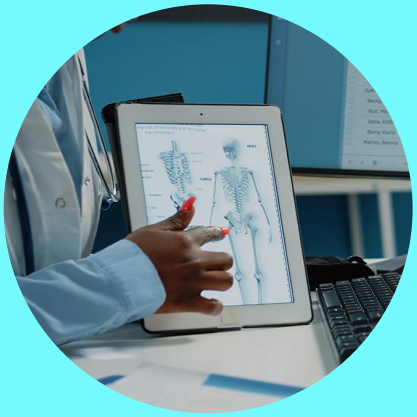
- Businesses are looking to run applications closer to the user and need the ability to guarantee security, high availability, and resiliency. The pandemic forced an immediate shift to work from home and corporations are looking for solutions that deliver their corporate applications in a secure and available environment. Edge plays a crucial role in this transition as businesses and individuals need an easy button for both application and network deployment.

Alef enables businesses to take advantage of the next major internet shift to 5G Edge infrastructure. We believe developers will build amazing things with edge technologies. Alef shoulders the complexity of cellular networks such as spectrum, reporting, roaming, and compliance, allowing you to connect easily. Our APIs give creators superpowers to launch 5G edge applications at the push of a button.

These new experiences will drive economies, large and small. And most likely, there will be interactions and apps we have yet to even imagine. We are ready to journey with you into the future of the exciting and new. Consider this your tour of amazing innovations that will be made possible by edge computing. This is just the beginning.

To infinity and beyond!

Table of Contents



Edge Compute Attributes

Locating computing power at the edge of the mobile network, closest to the point of consumption, is the defining attribute of edge computing. The following attributes are the hallmarks of edge compute:

Compute Offload

The edge promises improved performance and functionality decoupled from the specifications of any given device. Edge locations carry the computational weight, allowing for slim individual devices. This means edge technologies can be widely available, and that updates are pushed to edge locations rather than devices. If a device can connect to the edge, a world of opportunity is available.

For example, offloading the computational effort to the edge enables us to use machine learning algorithms despite a slim device.

High Bandwidth

Video cameras, webcams, and sensors are steadily outputting more data as a result of better manufacturing techniques and scale. The network that these devices are connected to needs a high bandwidth to effectively handle this increased output.

Low Latency

Sometimes decisions can wait, sometimes they can't. Real time applications such as robotics, high definition communications, augmented reality games, mixed reality, industrial automation, pharmaceutical production, manufacturing, or applications with a high number of concurrent live users will require low latency to drive those speedy decisions.

Robotics and mixed reality are two great examples that need low latency. Robotics for fulfilment centers or even home use need low latency because a delay can mean that the robot falls over or crashes. For mixed reality, latency can cause the user to become dizzy or perceive the data incorrectly.

Secure Private Network

Data deserves proper stewardship and edge technologies can help control who has access to your data. On-demand private 5G can deliver on the promise of a secure private network across multiple use cases. Proximity to an edge location is required to access the data, which cuts off a number of attack vectors. Private networks can be established for communities that are geographically close, but don't want to be accessible from the outside.

Drones, hospital systems, and schools are great examples. Drones can come in contact with humans and the faces need to be protected from the prying eyes of the public. Hospital systems need to protect the sensitive patient data, and schools also fall into the category of needing to protect facial information.

Edge Compute Benefits

These four foundational attributes of edge compute (Compute Offload, High Bandwidth, Low Latency, and Secure Private Network) reap numerous benefits for the developer. Applications have better security, scalability, reliability and operate with high efficiency.

Privacy and Security

With edge computing, data that is produced by devices connected to the 5G cell tower can be processed at the cell tower without leaving. When the data can be immediately processed at the edge, no latencies associated with encryption and decryption are incurred. This provides a level of speed, security, and privacy for sensitive data that would otherwise be hard to achieve.

Scalability

Software defined infrastructure enables the automated deployment of cellular infrastructure and computing resources. Businesses can trust that their applications will be consistently deployed and scaled to their businesses needs, wherever the business physically is located.

Reliability

With cellular level reliability and redundancy, applications that run at the cell tower will continue to run regardless of the rest of the network. The application reliability and failover demands of critical operations are met with multiple towers and server redundancy per tower in any given city.

Edge computing puts the application intelligence at the cell tower, democratizing the brains of the app while enabling an increased responsiveness and throughput of applications. Machine vision, facial recognition, and augmented reality are applications that can benefit from increased computing resources at the cell tower. Edge computing also satisfies the requirement of high bandwidth and localized processing. Streaming video from an edge server for augmented reality is a good example of edge native applications. Currently, latencies required for this use case are not met causing the user to get physically dizzy from a slow video feed. Instead with the edge, the proper latencies are met and greatly improves the end user experience.

Efficiency

Moving parts of an application out to the edge increases application efficiency by eliminating transport of useless data. Machine vision analysis of a video camera is an example use case. The video device produces a large amount of data (think 4K camera outputting ~700MB/s) and it is the faces in the video feed that is important and not the raw video feed itself. The ability to decipher what is a face and subsequently only sending this data, greatly reduces the strain put on the network. Other stateless applications might be a service that listens for screams or gunshots and then alerts the appropriate entities as to the location. This type of data is considered stateless and doesn't need to be stored.

Real Time Visual Advertising

Visual ads populate the urban and suburban environment, from Times Square, to large billboards that are scattered around major US cities, to ads along freeways, in airports, and anywhere people congregate. Machine learning enables critical targeting data to be obtained via low cost web cams. The increased targeting of visual ads can in turn be leveraged for more relevant advertisements to be served that come with higher CPMs. As an additional benefit, if an advertiser owns multiple displays, ads can be repeated for a specific customer to aid retargeting. Furthermore, sentiment can be tracked while delivering the advertisement to better understand the effects of the ad.

The Technicals

By leveraging machine learning via a camera mounted above a digital display, advertisers are able to customize ads for the people present at a given digital display. The process of real time visual advertising involves identifying the target individual, running the machine learning algorithm to determine age, sentiment, gender, and other traits, selecting the ad, and then delivering the ad, all before the person walks by the screen. This process requires real time computing at the edge and the ability to load the data intensive ads to the high definition displays.

Enhanced Visual Advertising

Digital displays become more intelligent once the ad can leverage machine learning and the camera. This intelligence comes in the form of identification of more features of an individual or group of individuals on either a single display or across multiple displays. This ability enables advertisers to intelligently test ads on individuals across multiple displays. This sentiment analysis can be used as input to determine which follow-up ads are shown.

Interactive Visual Advertising

Taking this concept another step further, a speaker and microphone can be added to the display along with the camera to enable full interactivity.

This ability of directly engaging the potential customer can lead to product feedback in ways that were previously not possible or difficult to acquire. Users can be engaged with an A/B preference test where the user is shown the same product with different colors or features and then asked to choose between the two options. Another interesting study that can be run would be a price card study where the user is shown multiple prices for a product. And finally, if the user is interested, a remote associate could call into the display to ask questions, answer questions, or close a sale.

Security Solutions

By running machine learning at the edge, security vendors can upgrade basic IoT device capabilities with human-like performance and also enable a single operator to manage a larger number of cameras. System architecture simplifies with the data immediately processed at the edge as there is no longer a need to send data to a central server for processing. This saves on bandwidth costs when compared to traditional remote monitoring schemes.

The Technicals

By enabling machine learning to run on computing resources physically close to the surveillance location, the capabilities leveraged can be enabled across multiple devices and locations. When it comes time to upgrade the capabilities, an upgrade of the hardware at the edge location can upgrade the capabilities of all connected security devices.

Building Video Surveillance

Video surveillance has traditionally been a localized system that requires human oversight to process the video feeds. Machine learning enables a single human to efficiently process a greater number of cameras with real time alerts. In addition to efficiencies, new capabilities like audio analysis for screams for help or breaking of items will make such systems more useful and valuable.

Construction Site Security

There are a lot of raw materials as well as expensive equipment stored at construction sites that can be targeted for theft. Edge enabled cameras can now help overseers watch a larger area, identify potential issues, and even notify the proper authorities depending on the situation.

Campus Surveillance and Security

Students are on campuses at all hours and having a security system that can passively operate as well as identify screams for help can mean the difference between life and death. Machine learning at the edge can help with quickly identifying the location of the event based on the nearest camera and speaker enabling a remote responder to react and assist immediately.

Distributed Workforce Security

With the rise of distributed workforces, more corporate data than ever before is being shared across the public internet. Although many organizations use VPNs and encryption technology, the majority of services they use are still located in the cloud. Cloud solutions centralize information offering the potential of a single point of penetration for hackers. The Edge and its distributed approach allows for localized information processing and limits the amount of sensitive information transmitted across the internet.

Smart(er) Devices

Devices that are unintelligent can now be endowed with intelligence that enables real time interactivity and experiences. Imagine toasters, mirrors, and kitchen appliances that understand and can react to spoken English and can even suggest settings based on what it sees. Microwaves can see what you have placed inside and automatically adjust settings for what it is cooking and for the user's preferences. Refrigerators can tell you when that milk you haven't touched for a week is about to go bad.

The Technicals

Making smarter devices will require video cameras, microphones, sensors, and machine learning. The device would take a picture with the video camera and send the image to the computing resources at the edge for processing. The same would be done for voice recognition handled through the microphone. Sensors like accelerometers, thermometers and more provide other relevant data depending on the application.

Smart Speaker

Speakers that normally only broadcast sound can now be paired with a microphone to gain the ability to interpret voice instructions using natural language processing (NLP) locally in order to run basic commands. Users can interact with other local digital devices like lights, thermostats, or microwaves by simply speaking.

By running NLP at the edge, the speakers provide value to the end user and the manufacturer is able to upgrade the product by simply pushing a software update to the edge. This saves in hardware costs and distribution complexity.

Connected Home - Robots

Toaster ovens that don't burn toast. Cleaning robots that won't push poop all over your carpet. Laundry robots that fold your clothes. Stovetops that automatically turn off in unsafe conditions. With neighborhood edge locations, much of the intelligence processing can be done at the edge, leading to easily upgradeable, lightweight devices that have better battery life. As home devices can rely on Edge processing, the cost, complexity, and size of these devices will decrease over time.

Connected Home - Healthcare, Fitness, and Wellness

Patient monitoring devices, augmented reality mirrors, and even digital workout assistants are some of the edge use cases that exist within a connected home. Human interaction can be achieved via intelligence enhanced speakers and cameras that augment the basic health care or fitness devices.

Wearable Compute + Object Augmentation

Wearable display technologies can be augmented with edge computing to deliver image recognition, view augmentation, and other advanced compute features. Edge computing can enable wearable devices to deliver more advanced interactions and information to the user.

These wearable devices can augment non-digital objects by overlaying data and displays. Stovetops, microwaves, kettles, TVs, desks and practically any other object within the home can be enhanced with these edge augmented displays. Knowing which object needs the augmented display and rendering the augmentation are the processes conducted on edge computing.

Transportation and Logistics

Automated vehicles with self guidance capabilities use machine vision to help guide their actions. This machine learning not only enables the vehicle to respond in real time, but also enables communication between vehicles both on a human and computer level. Logistics can benefit as well because smaller and more power efficient devices can leverage edge computing resources for the computing and analytics while being able to run for longer times.

The Technicals

Transportation and logistics edge applications make crucial decisions in real time. Such applications rely on cameras, sensors, gps devices and more. Performance is further enhanced by communication between other devices including nearby cars, traffic lights, and more.

Autonomous Vehicles

Autonomous vehicles rely on millions of inputs every second to adjust speed and direction. Much of this processing can be achieved with onboard computers and edge enabled vehicles will be able to do much more. Additional features include communicating with nearby cars and local data points for relevant information pertaining to traffic flow, weather, and more.

Freight Tracking and Routing

Trains and trucks can utilize Edge locations even in low-coverage areas to constantly update freight locations, monitor temperature or hazmat regulations, and more. When partnered with autonomous vehicles and robotics for loading/unloading, trucks could reroute based on inclement weather.

Connected Car

Connected cars can constantly monitor engine, fluids, tires, and electricals. That information can be relayed to Edge locations for software updates, maintenance schedules, and recalls. Maintenance will be streamlined; potential problems will be proactively identified based on thousands of other vehicles with similar mileage, components, or geographic locations.

Ports and Docking

Safely docking massive ships loaded with millions of tons of freight into crowded ports and harbors is a difficult process. Risks could be mitigated by using ship-based edge locations that constantly measure positioning and account for tides, waves, and currents. The sensors will need localized compute. In response to the reduced risk, edge technology could allow ships to dock closer together, freeing up valuable port space.

Travel

With edge compute, the world will feel smaller and more connected than ever before. People will travel with ease, in terms of navigation and transit, customs and borders, and language translation.

The Technicals

Natural language processing, image recognition, and augmented reality are machine learning algorithms that run at the 5G cell tower. The user's device will leverage this computing power to travel with ease.

Real Time Language Translation

Edge powered translation services could bring these technologies to rural or less connected locations, or where users do not have roaming available. Reliable streaming video could help convey nuance, proper pronunciation, and appropriate body language. This is a huge win for all language translation, but it is especially necessary for providing access to signed language translation.

Augmented Reality Navigation

Imagine you are in a new airport with no idea where to go. Edge powered augmented reality (AR) could help you easily navigate the airport whether you need to catch a connecting flight, grab a bite to eat during a longer layover, or navigate to baggage claim.

By streaming live video of what is in front of you to the local edge computing system, the software is able to create a digital twin to analyze your location in real time. It then paints virtual arrows on the ground, guiding you to where you need to go. By centralizing this capability at the airport, the computing resources are democratized and the data is always up to date as the airport changes in real time.

Personalized Assistance

As travelers wander around new locations, services running on edge computing can stream live video to real-time concierge services from within the city. With edge computing, the customer may not need to sign up for roaming data services and still receive high quality services such as translation or navigation.

Image Recognition

As travelers move about, they will likely come across objects such as signs that they are not familiar with. In addition to the detection of authorized travelers, edge powered image recognition has the capability to detect restricted travelers or contraband. With an Edge location strategically placed near an airport or sensitive site, computational logic is possible on the edge. This would reduce the possibility of bad actors interrupting the data feeds and improve processing time to allow for authorities to react to threats in real time.

Digital Passport

The future of travel may just be a digital passport, stored on a traveler's phone. Edge based apps that utilize facial recognition could streamline the processing of thousands of visas and update travel authorizations at ports of entry. Such a system could even be deployed at rural or unmanned regions, allowing for increased safety and security.

Infrastructure

The physical structures of our world are aging. The built environment, including roads, bridges, transit, and utilities, needs to keep up with the growing population and be as efficient as possible in a warming climate. Meeting these challenges will require smarter systems made possible by edge compute. Additionally, the internet is seen by many as a utility similar to water, sewer, or electricity. Edge technology, with its distributed nature and its ability to put compute power near the users decoupled from device compute power, has the potential to improve community access to the internet.

The Technicals

A network of cameras and sensors in both the built environment and in public and private vehicles connected to an edge location will allow for smarter infrastructure systems, better traffic management, environmental savings, and more. Edge locations will bring compute power to communities that may have had inconsistent or incomplete access to high speed internet.

Traffic management

Want to spend less time sitting in traffic? Smart traffic lights systems and connected cars could communicate via edge locations to optimize traffic flow based on real-time data.

Public transportation

Edge technology can connect trains, buses, and other forms of public transportation for more efficient operations. Patrons won't be left waiting and wondering with real-time location information and can seamlessly use the service with improved smart fare systems. Additionally, municipalities can measure ridership and route popularity, dynamically adjusting services based on need.

Smart utilities

Whether we are talking about power grids, water treatment facilities, or gas pipelines, the need to provide services and steward our resources is clear. Smart utilities can leverage the edge for low latency monitoring. This allows for essential real time adjustments that could improve water quality, keep an energy grid online, and much more.

Augmented Reality Field Service / Infrastructure Maintenance

Wearable display technologies can be augmented with edge computing to deliver image recognition, view augmentation, and other advanced compute features. Compute can be enhanced via edge computing to enable wearable devices to deliver more advanced interactions and information to the user.

By using a combination of edge computing and location information, field service technicians can leverage the knowledge of the edge compute system to recognize and display up to the minute details as well as historical knowledge that would otherwise be locked up in documentation. This enables more junior technicians to hit the ground running.

Infrastructure is aging, and proper inspection and maintenance can prevent catastrophes. Embedded microchips and sensors connected to edge locations can provide information about the forces exerted on a bridge or can help detect a leak in a sewer system. This information will allow engineers to make intelligent decisions about repair and replacement, increasing the lifespan of components and preventing dangerous failures.

Infrastructure Continued...

Democratized Computing Resources

Many areas around the world, in particular rural communities, often struggle with access to computational resources as well as connectivity for internet services. Utilizing regional edge locations, communities can offer subsidized, or lower cost, reliable high speed internet. Such an initiative could help communities and individuals compete in an economy that is increasingly online. Individuals and families would have reliable access to community services including emergency broadcasting, family services, and police and fire. This improved access contributes to the safety of the community as a whole.

Manufacturing and Construction

Manufacturing and construction will benefit from the promise of improved connectivity brought about by edge technology. Data heavy models will be accessible onsite and connected machinery will be able to conduct work with improved safety.

The Technicals

A local edge location could provide a construction site with improved connectivity and allow slimmer devices to access data heavy plans and models. GPS devices and cameras will allow machinery and robotics to operate safely and efficiently.

Robotics

Manufacturing robots are currently static and are preprogrammed to move to specific locations and are not intelligent enough to self guide their movement. By leveraging computing resources at the edge, manufacturing robotics can gain the intelligence necessary to self guide their actions and even become mobile. If the robots were able to move by themselves, this would enable a manufacturing revolution because the entire floor could be reconfigured without physical human intervention.

Smart safety devices

Safety equipment can utilize the low-latency capabilities and low-bandwidth requirements of the edge to monitor the environment in real-time for potentially hazardous situations. For example, miner's safety hats could be equipped with sensors designed to warn the wearer of toxic fumes.

3D printing

Current 3D printing is limited by the volume of data that must be transmitted. As edge locations become more prevalent, this processing volume will be less burdensome. Printers will be able to be deployed at smaller factories and remote locations like oil rigs, cattle stations, and farms.

Construction

In the construction industry time equals money. Work delays can be a disaster for a project, whether they are caused by supply chain issues or by mistakes made in the field that have to be addressed by a change order. Sometimes construction sites are in remote locations with poor connectivity. Edge technology could dramatically improve site connectivity, reduce work delays by coordinating assets, ensure the team is working from the latest digital blueprints including all change orders, and safely coordinate heavy machinery.

Remote Work

Remote work provides flexibility for employees and expands the hiring pool for employers, allowing them to hire excellent people regardless of location. Collaboration and camaraderie are still very important to teams, and edge technology can help keep teams connected.

The Technicals

Edge locations provide access to corporate only applications with efficiency and security. Underserved communities can also benefit from edge native applications that otherwise would require expensive hardware and software as well as high speed connectivity. The high bandwidth and low latency nature of edge technology will improve video conferencing and collaboration.

Video Conferencing

Everyone is more familiar with video conferencing technology than they were in 2019. The power of that technology is clear, but so are the associated problems. Edge technology promises higher definition video, lower latency, and improved experiences with features like screen sharing and captioning.

Education

Distance learning may make sense for a number of families even after the pandemic. Whether through choice or circumstance, kids who are being educated remotely deserve the same quality education as kids who are educated at a physical school location. Distance education also has the potential to change how we think about graduate programs and continuing education, making high quality programs more widely available.

The Technicals

Through the distributed nature of edge technologies, more households have access to high speed internet. The high bandwidth, low latency attributes of edge compute mean that higher quality video and more immersive experiences are possible.

Distance learning

The pandemic has caused a massive surge in the number of students relying on distance learning, with video apps playing a large role. Odds are high that the teachers and the students reside in the same city and this is an ideal edge video streaming use case. With both parties in the same city and maybe even sharing a cell tower, the video traffic can be routed directly between the participants, thereby avoiding a trip out to the internet as well as enabling the video conferencing to occur even if there is an internet outage.

Many students struggle with either poor video quality due to bandwidth or processing issues. With the ability to stream much higher quality video between local participants who are physically close, the distance learning of tomorrow may be a much better experience.

Healthcare

Healthcare is expensive, inefficient, and sometimes inaccessible. A rise in high quality telemedicine and virtual access to specialists will provide a higher standard of care. With IoT devices dropping in cost, advanced imaging and artificial intelligence capabilities can be used in tandem with edge computing to provide health care to more people.

The Technicals

Edge technology's high bandwidth and low latency allow for high quality telemedicine, advanced image processing, and diagnostics assisted by artificial intelligence. Connected devices with compute power located at the edge location will collect and process vital health data.

Telemedicine

Doctors are now gaining access to patient video feeds as a result of the pandemic. This presents an enormous opportunity to leverage machine vision as well as other devices to aid in diagnosis and ongoing treatments.

Telemedicine and high-quality video streaming via distributed edge locations will enable doctors to perform highly specialized procedures such as rehabilitative exercises by using the camera plus machine vision to make sure the patient is doing the exercise correctly.

Health Monitors

Health monitors in the form of both wearable and non-wearable devices can keep an eye on patients. By offloading the intelligence to a nearby edge location, these medical devices can run for longer periods, have a smaller form factor, and have upgraded capabilities compared to today's devices.

For non-wearable devices, we are referring to cameras, sensors, and other speciality medical devices. With cameras, the system can utilize machine vision to keep an eye on patients by monitoring their location as well as their active physical status. An example of physical status would be if the person is upright or horizontal. If the person is horizontal and not in a bed, then there might be a medical issue that needs to be verified.

Overall device cost can be reduced by offloading device intelligence and compute to the edge. This would potentially be more cost effective for the user as the initial capital outlay would be reduced, increasing access.

Surgical Robots

Robots that aid in surgery are highly specialized and with augmentation in the near future we may also see surgeons remotely controlling surgical robots, where even millisecond details could cause a patient to hemorrhage.

Farming & Environmental

Farming has grown from the days of a single farmer with some helpers to a semi automated large scale production operation. Farming has also started to pick up in cities and suburbs as everyday people have planted both community and backyard gardens to have access to their own local food supply.

The same challenges of managing a growing crop exist at both large and small scale–nutrient dispersion timing, removal of weeds, and monitoring of plant health.

The Technicals

IoT sensors, drones, and robots come into play for both small and large scale farming. Machine vision can be used to spot weeds and robotics used to remove the weeds. IoT sensors can be controlled at the edge.

General Environmental Inspection

Understanding how the environmental ecology is changing over time is critical to planning and response. By leveraging drones, machine vision, and edge computing, teams can have a better understanding for rapidly changing situations, such as wildfires and spills into water, and longer term situations such as deforestation.

Drone Farm Inspection

Smart farming is about collecting the right data and using it to optimize your resource-planning and operation. Machine vision technologies are making waves in the agriculture sector because they can visually inspect large areas in a fraction of the time it would take a human.

Farm Robotics

Self-guided farming equipment and vision-based automation can leverage edge computing's high bandwidth and compute off-load. Spotting weeds, moving earth, and even picking the vegetables are robotics that can leverage the help of edge computing.

Entertainment

Augmented reality (AR) and virtual reality (VR) entertainment options are beginning to grab more mindshare as the graphics and interactive capabilities of these technologies become more advanced and immersive. Any surface can now become playable and the games leave the digital screen to merge with the real world. For VR, the worlds become more immersive and the fully immersive digital experience is rendered at the edge and then streamed to the user, keeping the body worn devices cost effective.

The Technicals

Creating a shared digital experience between two devices can be challenging if the devices do not have sufficient compute power or the right sensors. By offloading compute to the edge, low powered devices can gain the ability to create shared AR gaming experiences.

Augmented Reality Gaming

Imagine being able to pop up a game on your coffee table to be shared between you and your friends or kids. The game could be a battle between orcs and wizards or it could be a cooking game where you need to serve your customers as quickly as possible. Any surface can now become a playground and the objects on the table can also be digitized to be part of the game.

Massive Multiplayer

Games that are trying to coordinate a large number of players will benefit from the server being closer to the players. If you've ever experienced a game that seems to "skip" or pause for a split second, this is due to either player or game server latency. With more players coming into a game, latency can be eliminated by locating the game server in the same room as the players. It's a LAN party, but wireless and with the compute power sitting much closer to the players.

Private 5G Edge Network

Private networks have existed since computers were first networked because there was either a need to keep computers hidden from the wider internet or a need of being able to address an unlimited number of computers. Most people have likely set up a private network without knowing it! If you have plugged in a modem with a built in router, you've set up a private network.

While a private 5G Edge network is the basis for practically all of the use cases in this report, this section specifically addresses networking as a distinct feature because setting up hardware still requires work and configuration. This is where a private 5G Edge network shines because a lot of the setup is abstracted away.

The Technicals

With CBRS, 5G, and connectivity APIs from Alef, setting up a private network that is 5G Edge enabled becomes much simpler, comes with more security, and less hardware. Smartphones and select adapter devices starting from 2020 that are band 48 or CBRS enabled can join a private 5G Edge network.

Private Network for Home

As applications become more sophisticated, users might want to dynamically create networks that are linked to specific devices to facilitate household tasks. A user may wish to isolate their home devices such as, personal security cameras, digital assistants, or networked appliances from the internet.

Private Network for Remote Employees

With remote work becoming increasingly popular, corporate applications would benefit from being loaded closer to the employee's home. Security would be inherently enhanced with only 5G enabled devices being able to access the custom private network deployed for the select employee.

Private Network for Infrastructure Equipment

Infrastructure equipment would benefit from the automatic deployment of hardware as soon as the device turns on and also from network isolation. As an example, power generation devices could be designed to operate in isolation and only look for an emergency on/off command from an authorized central authority. This way, only devices authorized on the custom private network are allowed to access the power generation device.

Private Network for IoT

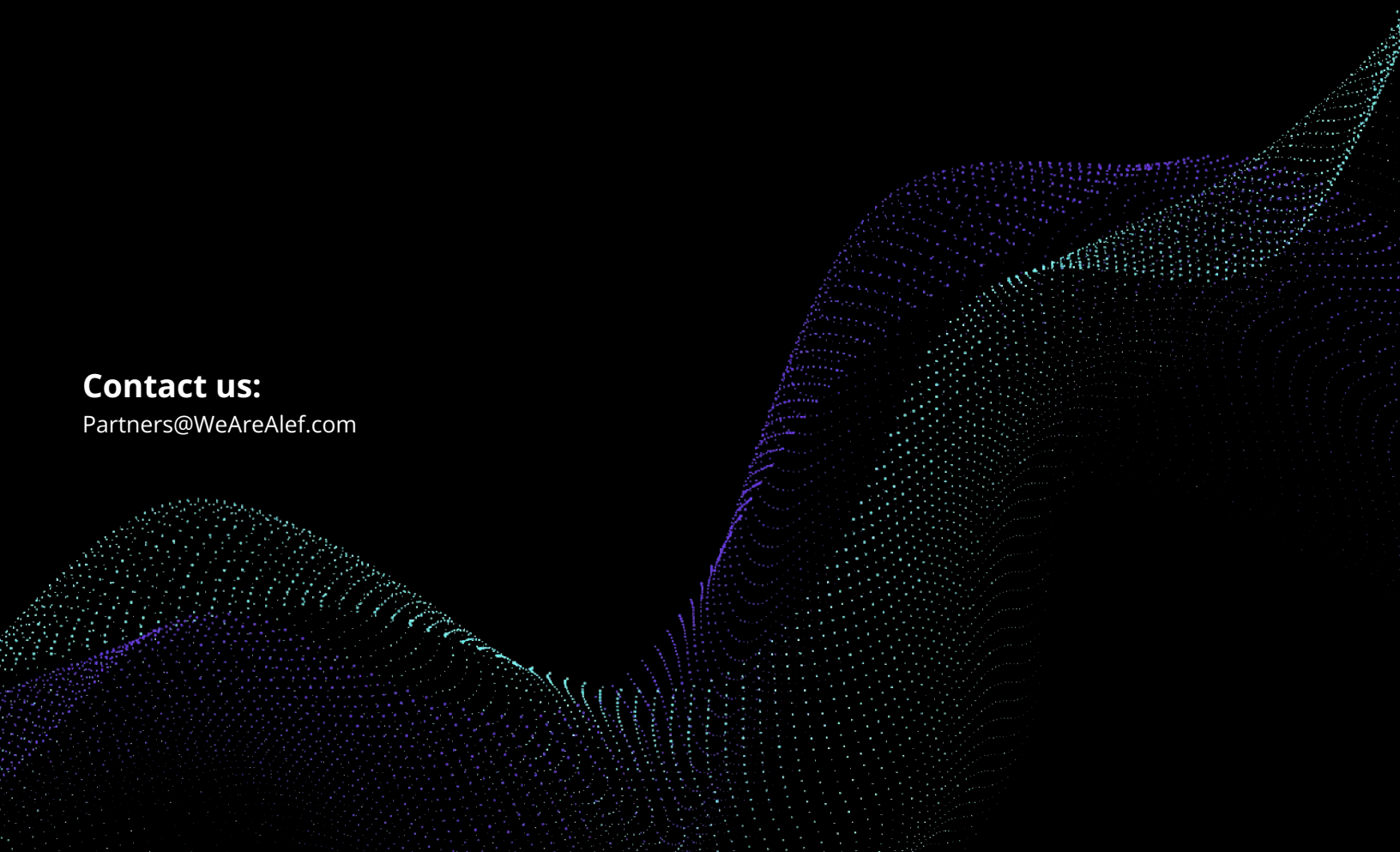
IoT devices can have the ability of automatic deployment and network isolation. Consumer IoT devices can be deployed to the field with a preconfigured sim such that the device automatically boots and connects to a remote or edge server upon boot. This ensures that there isn't a need for a technician during deployment.

Conclusion

Edge technology has the potential to change the world. This report has covered the innovation that edge technology will bring to a dozen industries, but it is just the start. We will be limited only by our imagination.

At Alef, we are excited to invite developers to use our APIs to easily access the benefits of edge computing and build an amazing future.

We can’t wait to build with you.



Contact us:

Partners@WeAreAlef.com